

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE FORM PTO-1390 (REV. 11-2003)		ATTORNEY'S DOCKET NUMBER 3606-0121P
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 10/Q69545
INTERNATIONAL APPLICATION NO. PCT/EP00/07120	INTERNATIONAL FILING DATE July 24, 2000	PRIORITY DATE CLAIMED August 27, 1999
TITLE OF INVENTION METHOD AND SYSTEM TO SYNCHRONIZE MOBILE UNITS TO A BASE TRANSCEIVER STATION		
APPLICANT(S) FOR DO/EO/US DE ANGELI, Alfonso; DE BENEDITTIS, Rossella; MARNONI, Luca		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
<p>1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39 (1).</p> <p>4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31).</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ul style="list-style-type: none"> a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau. WO 01/17137 c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). </p> <p>6. <input type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). <ul style="list-style-type: none"> a. <input type="checkbox"/> is transmitted herewith. b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4) </p> <p>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)). <ul style="list-style-type: none"> a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input checked="" type="checkbox"/> have not been made and will not be made. </p> <p>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</p> <p>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</p> <p>10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</p>		
Items 11. to 20. below concern document(s) or information included:		
<p>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98, Form PTO-1449(s), and International Search Report (PCT/ISA/210) with 5 cited document(s).</p> <p>12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</p> <p>13. <input checked="" type="checkbox"/> A FIRST preliminary amendment.</p> <p>14. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</p> <p>15. <input type="checkbox"/> A substitute specification.</p> <p>16. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825.</p> <p>18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4).</p> <p>19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).</p> <p>20. <input checked="" type="checkbox"/> Other items or information: <ul style="list-style-type: none"> 1.) PCT/IPEA/416 and PCT/IPEA/409 2.) One (1) sheet of Formal Drawings </p>		

U.S. APPLICATION NO (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER																				
NEW 10/069545		PCT/EP00/07120																				
		3606-0121P																				
<p>21. <input checked="" type="checkbox"/> The following fees are submitted:</p> <p>BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5):</p> <p>Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. \$1,040.00</p> <p>International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$890.00</p> <p>International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO. \$740.00</p> <p>International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4). \$710.00</p> <p>International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4). \$100.00</p>		CALCULATIONS PTO USE ONLY																				
ENTER APPROPRIATE BASIC FEE AMOUNT =		\$ 890.00																				
<p>Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).</p>		\$ 0																				
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>CLAIMS</th> <th>NUMBER FILED</th> <th>NUMBER EXTRA</th> <th>RATE</th> </tr> </thead> <tbody> <tr> <td>Total Claims</td> <td>18 - 20 =</td> <td>0</td> <td>X \$18.00</td> </tr> <tr> <td>Independent Claims</td> <td>2 - 3 =</td> <td>0</td> <td>X \$84.00</td> </tr> <tr> <td colspan="2">MULTIPLE DEPENDENT CLAIM(S) (if applicable)</td> <td>Yes</td> <td>+ \$280.00</td> </tr> <tr> <td colspan="2"></td> <td></td> <td style="text-align: right;">TOTAL OF ABOVE CALCULATIONS =</td> </tr> </tbody> </table>		CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	Total Claims	18 - 20 =	0	X \$18.00	Independent Claims	2 - 3 =	0	X \$84.00	MULTIPLE DEPENDENT CLAIM(S) (if applicable)		Yes	+ \$280.00				TOTAL OF ABOVE CALCULATIONS =	\$ 1170.00
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE																			
Total Claims	18 - 20 =	0	X \$18.00																			
Independent Claims	2 - 3 =	0	X \$84.00																			
MULTIPLE DEPENDENT CLAIM(S) (if applicable)		Yes	+ \$280.00																			
			TOTAL OF ABOVE CALCULATIONS =																			
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.		\$ 0																				
SUBTOTAL =		\$ 1170.00																				
<p>Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).</p>		\$ 0																				
TOTAL NATIONAL FEE =		\$ 1170.00																				
<p>Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +</p>		\$ 40.00																				
TOTAL FEES ENCLOSED =		\$ 1210.00																				
		Amount to be: refunded \$ charged \$																				
<p>a. <input checked="" type="checkbox"/> A check in the amount of \$ 1210.00 to cover the above fees is enclosed.</p> <p>b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.</p> <p>c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>02-2448</u>.</p>																						
<p>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</p>																						
<p>Send all correspondence to: Birch, Stewart, Kolasch & Birch, LLP or Customer No. 2292 P.O. Box 747 Falls Church, VA 22040-0747 (703) 205-8000</p>																						
<p>Date: <u>February 27, 2002</u></p>																						
<p>By _____ Michael K. Mutter, #29,680</p>																						
<p>/cgc</p>																						

PATENT
3606-0121P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: DE ANGELI, Alfonso et al.

Int'l. Appl. No.: PCT/EP00/07120

Appl. No.: New Group:

Filed: February 27, 2002 Examiner:

For: METHOD AND SYSTEM TO SYNCHRONIZE
MOBILE UNITS TO A BASE TRANSCEIVER
STATION

PRELIMINARY AMENDMENT

BOX PATENT APPLICATION

Assistant Commissioner for Patents
Washington, DC 20231

February 27, 2002

Sir:

The following Preliminary Amendments and Remarks are respectfully submitted in connection with the above-identified application.

AMENDMENTS

IN THE SPECIFICATION:

Please amend the specification as follows:

Before line 1, insert --This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/EP0007120 which has an International filing date of July 24, 2000, which designated the United States of America.--

IN THE CLAIMS:

Please amend the claims as follows:

2. (Amended) Method according to claim 1, characterized in that the marking of the synchronization signal (S) by the base transceiver station includes at least a polarity inversion of the relative modulation elementary units.

3. (Amended) Method according to claim 2, characterized in that the marking of the synchronization signal (S) by the base transceiver station includes two polarity inversions of the relative modulation elementary units in two consecutive frames (F_x, F_{x+1}).

4. (Amended) Method according to any of claims 1 to 3, characterized in that the extraction from the pointer message (P) of the position of at least a system message (M') includes the decoding of the frame number of such system message (M').

5. (Amended) Method according to claim 4, characterized in that the extraction from the pointer message (P) of the position of at least a system message (M') includes the decoding of the multiframe number of such system message (M').

6. (Amended) Method according to any of claims 1 to 3, characterized in that the marking of the synchronization signal (S) by the base transceiver station takes place with periodicity multiple of its own multiframe period.

8. (Amended) System according to claim 7, characterized in that it includes at least a user equipment with means adapted:

to detect the marked synchronization signal (S') from said base transceiver station;

to receive the pointer message (P) transmitted by said base transceiver station, and

to extract from the pointer message (P) the position of at least a system message (M').

10. (Amended) System according to claim 7, characterized in that it is adapted to implement the method according to claim 1.

REMARKS

The specification has been amended to provide a cross-reference to the previously filed International Application.

The claims have been amended to correct improper multiple dependencies and to place the application into better form for examination. Entry of the above amendments is earnestly solicited. An early and favorable first action on the merits is earnestly solicited.

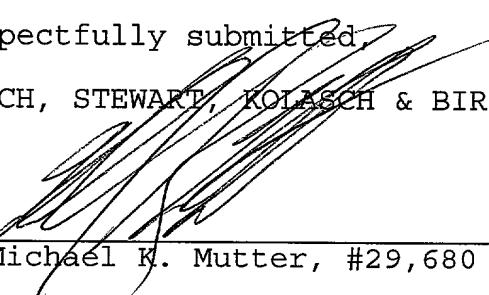
Attached hereto is a marked-up version of the changes made to the application by this Amendment.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By


Michael K. Mutter, #29,680

P.O. Box 747

Falls Church, VA 22040-0747

(703) 205-8000

MKM/cqc
3606-0121P

Attachment: VERSION WITH MARKINGS TO SHOW CHANGES MADE

(Rev. 02/21/02)

VERSION WITH MARKINGS TO SHOW CHANGES MADE

The claims have been amended as follows:

2. (Amended) Method according to [the previous claim]claim 1, characterized in that the marking of the synchronization signal (S) by the base transceiver station includes at least a polarity inversion of the relative modulation elementary units.

3. (Amended) Method according to [the previous claim]claim 2, characterized in that the marking of the synchronization signal (S) by the base transceiver station includes two polarity inversions of the relative modulation elementary units in two consecutive frames (Fx, Fx+1).

4. (Amended) Method according to [one of the previous claims]any of claims 1 to 3, characterized in that the extraction from the pointer message (P) of the position of at least a system message (M') includes the decoding of the frame number of such system message (M').

5. (Amended) Method according to [the previous claim]claim 4, characterized in that the extraction from the pointer message (P) of the position of at least a system message (M') includes the decoding of the multiframe number of such system message (M').

6. (Amended) Method according to [any claim 1 to 3]any of claims 1 to 3, characterized in that the marking of the synchronization signal (S) by the base transceiver station takes place with periodicity multiple of its own multiframe period.

8. (Amended) System according to [the previous claim]claim 7, characterized in that it includes at least a user equipment with means adapted:

to detect the marked synchronization signal (S') from said base transceiver station;

to receive the pointer message (P) transmitted by said base transceiver station, and

to extract from the pointer message (P) the position of at least a system message (M').

10. (Amended) System according to [any claims 7 to 9]claim 7, characterized in that it is adapted to implement the method according to [any claims 1 through 6]claim 1.

1/Prts

- 1 -

«METHOD AND SYSTEM TO SYNCHRONIZE MOBILE UNITS TO A BASE TRANSCEIVER STATION»

5 Field of the Invention

The present invention relates to a method to synchronize mobile units to base transceiver stations in digital telecommunication networks, in particular with time division duplex access (TDD), such as for instance mobile telecommunication networks belonging to the UMTS standard (*Universal Mobile Telecommunication System*), both 10 in the TDD-CDMA version (*Time Division Duplex- Code Division Multiple Access*) proposed by the 3GPP organization (*3rd Generation Partnership Project*) and in the TD-SCDMA version (*Time Division – Synchronous Code Division Multiple Access*) proposed by the CWTS organization (*Chinese Wireless Telecommunication Standards*). The present invention relates also to a system implementing this method.

15 It is known that in mobile telecommunication networks with TDD access the transmission and reception of radio signals from and to the base stations, called BS in UMTS environment, do not occur at the same time, but are alternated in a continuous sequence of periods having predefined duration, each one of them, called *frame*, is conveniently coded and identified by the system. For instance, the UMTS base 20 transceiver stations generally transmit the signals to the mobile units, called UE (*User Equipment*), in the first half of the frame or semiframe (*downlink* procedure), and receive in the second half frame the signals transmitted by the user equipment itself (*uplink* procedure). In particular, each frame lasts 10 ms, subdivided into a plurality of time intervals (*timeslots*), they too having predefined duration, while the two semi 25 frames can have equal or different duration.

Inside each timeslot the reception/transmission of the useful signal occurs according to the time division access technique called TDMA (*Time Division Multiple Access*). Moreover, in each timeslot a plurality of signals can be code division multiplexed according to the CDMA access technique (*Code Division Multiple Access*), 30 so that each radio channel is defined by a particular timeslot and one or more particular access codes.

It is therefore clear that to avoid dangerous interference between the base

transceiver stations and user equipments and/or to optimize the communication transfer from a base station to another one, according to a procedure called *handover*, it is necessary that frames are synchronized among them, in order to be able to separate the transmission and reception periods of user equipment from those of base stations and
5 vice versa. Moreover, it is convenient that also the sequences of digital codes associated to each frame, which are cyclically repeated in time, match during the communications, in order to be able to speed up the above mentioned *handover* procedure in the user equipment. This last synchronization type is called *multiframe synchronisation*. An additional synchronization level, called *superframe*, consists in the numbering of
10 multiframe through sequences which are cyclically repeated in time. Through the hierarchical subdivision of superframes into multiframe and frames, it is therefore possible to define a plurality of service channels whose collocation inside a particular multiframe and/or superframe is known in advance.

To allow the user equipments to synchronize, the base transceiver stations
15 transmit a synchronization signal in a particular channel called SCH (in 3GPP environment) or SYNC (in CWTS environment), which is coded in a different manner from the other channels, superimposing to them in a non-orthogonal mode. In this way the user equipment can easily distinguish the synchronization channel from the remaining channels even in noisy electromagnetic environment.

20 In particular, the synchronization signal includes a sequence of modulation elementary units, called *chips*, showing best self-correlation and cross-correlation properties in order to be easily identified by user equipment. This sequence allows to identify the group of codes of the specific base transceiver station, as well as the position in the frame, that is the timeslot and the access codes, of a particular service
25 channel called *broadcast* or CCPCH (*Common Control Physical Channel*). This service channel contains the system messages necessary to the user equipment to have access to network services, such as for instance the operator and cell identifiers, the type of services available, the incoming call (*paging*) and other messages.

However, considering the limited capacity of each radio channel, said system
30 messages shall be often subdivided into several segments or *bursts* that are transmitted in more time multiplexing consecutive frames. This means that for a correct reconstruction of the message, the user equipment have to assemble the different

segments received, re-composing the same in accordance with the transmission order. Since the service channel can transmit different types of system messages, it is necessary to identify the type of each message in order that the user equipment can perform the correct decoding and possibly reject in advance the messages considered
5 not interesting, in this way reducing the use of the available resources and therefore the consumption.

Back ground art

The identification of the type of system message transmitted by base stations can be made adding a header, which however reduces the neat capacity of the transmission
10 channel, or associating the type of message to the frame number where it is placed, but this requires to unprofitably code in permanent manner the time multiplexing of the messages in the multiframe.

Scope and summary of the Invention

Scope of the present invention is therefore that to indicate a method and a
15 synchronization system, free from the above mentioned drawbacks. Said scope is attained with a method and a system whose main characteristics are specified in claims 1 and 7, respectively, while other characteristics are specified in the appended claims.

Thanks to the marking of the synchronization signal and to the transmission of a particular pointer message, both executed by the base transceiver station, the method
20 according to the present invention allows to reduce the power consumption of the user equipment, since it is possible to optimize the listening time of system messages avoiding the examination of the messages considered not interesting by the user equipment.

A further advantage of the method according to the present invention consists in
25 optimizing not only the listening times, but also the transmission capacity of system messages, since it is possible to mark the messages in the service channel without transmitting header which would reduce the transmission capacity.

An additional advantage of the method according to the present invention is represented by the possibility to extend or increase the kinds of system messages
30 without modifying the structure of the physical channels, as well as by the robustness due to the use of the synchronization physical channel to point to a logic channel which in turn points to other logic channels, thus availing of the easy reception of the

synchronization channel itself.

According to a particular aspect of the method of the present invention, the marking of the synchronization signal transmitted by a base transceiver station can be used also to synchronize in multiframe other base transceiver stations capable of directly receiving said signal.

According to another particular aspect of the method of the present invention, the marking of the synchronization signal by the base transceiver station includes one or more consecutive polarity inversions of the relevant modulation elementary units. In this way, the best self-correlation and cross-correlation properties of the synchronization signal are not decreased, thus maintaining its easy reception unchanged, particularly in noisy electromagnetic environments.

Moreover, the method according to the present invention can be easily implemented with least modifications to the known telecommunication systems, since the implementation of the relevant operational steps in the base transceiver stations and in user equipment requires only *software* but not *hardware* modifications.

Brief description of the drawings

The present invention together with further advantages and characteristics thereof may be understood by those skilled in the art making reference to the following detailed description taken in conjunction with the accompanying drawings in which:

- 20 – figure 1 shows a partial diagram of the structure of radio channels in a first embodiment of the method according to the present invention; and
- figure 2 shows a partial diagram of the structure of radio channels in a second embodiment of the method according to the present invention.

Detailed description of some preferred embodiments of the invention

With reference to figure 1, we can notice that in a first embodiment of the method according to the present invention at least one base station transmits the radio signals that can be received by one or more user equipment in the known manner, and vice versa. Said signals are subdivided into a plurality of frames Fn, for instance Fx-1, Fx, Fx+1, Fx+2, Fx+3, in their turn subdivided into a plurality of timeslots Tn, for instance from T1 to Ti, and into a plurality of access codes Cn, for instance from C1 to Cm. Furthermore, the base transceiver stations transmit a synchronization signal S in a coded channel in a manner different from the other channels, for instance phase modulating

the radio carrier according to the BPSK technique (*Binary Phase Shift Keying*).

This synchronization signal S includes in the known way a sequence of modulation elementary units, enabling to identify the group of codes of the specific base transceiver station, as well as the timeslot and access codes, for instance the timeslot T1
5 and code C1 of the service channel containing the system messages M necessary to the user equipment to have access to network services. To obtain the content of messages M, often subdivided into segments transmitted in more consecutive frames, the user equipment receive and decode the signal S.

In the first embodiment of the method according to the present invention, the base
10 station conveniently modifies the sequence of modulation elementary units of the synchronization signal S in a frame Fn, for instance in the frame Fx, to the purpose of signaling to user equipment the presence of a particular pointer message P in the service channel of the same frame or of a subsequent frame whose position is known in advance.

15 The pointer message P, which preferably occupies one sole frame to speed up the acquisition time, contains in its turn the frame synchronisms of higher hierarchical order, that is the information relevant to the multiframe and possibly to the superframe. This information enables to know when the first segment of a new system message starts and therefore determine the position, for instance in the frame Fx+3, of a
20 particular system message M', which in its turn can be subdivided into more consecutive frames. The user equipments, on reception of the synchronization signal S' marked by the modified sequence of modulation elementary units, decode the pointer message P and possibly examine, whether interesting, the system message M' pointed by the pointer message P.

25 In particular, in the present embodiment the marking of the sequence of modulation elementary units is obtained modulating the sequence of signal S with logic coefficient -1, that is, inverting its polarity. The detection of polarity of the sequence marked S' in the synchronization channel can coherently occur, averaging the polarities of more subsequent frames to reduce possible errors, or incoherently, making a
30 difference between the polarities of two subsequent frames.

With reference to figure 2, we see that a second embodiment of the method according to the present invention differs from the first embodiment in that the

synchronization signal marked S' indicates to the user equipments the presence of the pointer message P in the service channel of a frame F_{x+n} following the one where the signal marked S' is present (in the example n = 1). In the following frame F_{x+n+1}, this signal, instead of returning to the original state S, for instance at non inverted polarity,
5 remains in the modified state S' until it is necessary to indicate the presence of another pointer message P. Therefore, in the present embodiment, the presence of pointer messages P is indicated by the base station to the user equipments through a transition of the status of the synchronization signal. In the figures, arrows indicate the pointing from signals marked S' to pointer messages P, as well as from pointer messages P to the
10 first segment of the new system messages M'.

In another embodiment of the method according to the present invention the marking of the synchronization signal S by the base transceiver station occurs with multiple periodicity versus its own multiframe period. In this way, the marking of the synchronization signal transmitted by a base transceiver station can be used also to synchronize in multiframe other base transceiver stations capable of directly receiving
15 said signal.

The method according to the present invention can also be applied to the particular mechanism of system messages transmission on the service channel, which has been proposed in the 3GPP. In said field, system messages are sent in blocks that
20 can have each, different characteristics, such as for instance the repetition speed. Among said block, a *master* block is defined, listing and describing all the blocks currently in use in the base station, and gives also a method to determine when any information is updated. The marking of the synchronization signal S and the transmission of the pointer message P could, in this case, enable the user equipments to
25 quickly identify the *master* block and consequently perform an effective acquisition of all the necessary system information.

Therefore, while an embodiments of the present invention has been shown and described, it should be understood that other embodiments and/or additions thereto, in particular in the marking algorithm of the synchronization signal S, can be made by
30 those skilled in the art without departing from the scope thereof.

CLAIMS

1. Method to synchronize at least a user equipment to at least one base transceiver station belonging to a digital telecommunication network, in which radio signals transmitted and received by said base station are subdivided into frames (Fn) having predefined duration and each frame is subdivided into a predefined number of timeslots (Tn) and codes (Cn), said signals including at least a synchronization signal (S), which is transmitted by the base transceiver station and contains a modulation elementary units sequence suitable to identify the timeslot (T1) and the code (C1) of a service channel containing a system messages (M), characterized in that it includes the following operational steps:

- marking the synchronization signal (S), in at least one frame (Fx), by the base transceiver station;
- transmitting a pointer message (P) in the service channel of such frame (Fx), or of a subsequent frame (Fx+n), by the base transceiver station;
- detecting the marked synchronization signal (S') by the mobile unit;
- receiving the pointer message (P) by the mobile unit;
- extracting from the pointer message (P) the position of at least a system message (M') by the mobile unit.

2. Method according to the previous claim, characterized in that the marking of the synchronization signal (S) by the base transceiver station includes at least a polarity inversion of the relative modulation elementary units.

3. Method according to the previous claim, characterized in that the marking of the synchronization signal (S) by the base transceiver station includes two polarity inversions of the relative modulation elementary units in two consecutive frames (Fx, Fx+1).

4. Method according to one of the previous claims, characterized in that the extraction from the pointer message (P) of the position of at least a system message (M') includes the decoding of the frame number of such system message (M').

5. Method according to the previous claim, characterized in that the extraction from the pointer message (P) of the position of at least a system message (M') includes

the decoding of the multiframe number of such system message (M').

6. Method according to any claim 1 to 3, characterized in that the marking of the synchronization signal (S) by the base transceiver station takes place with periodicity multiple of its own multiframe period.

5 7. System to synchronize at least one user equipment to at least one base transceiver station belonging to a digital telecommunication network, in which radio signals transmitted and received from said base station are divided into frames (Fn) having predefined duration and each frame is subdivided in a predefined number of timeslots (Tn) and codes (Cn), said signals including at least a synchronization signal (S) which is transmitted by the base transceiver station and includes a sequence of modulation elementary units suitable to identify the timeslot (T1) and the code (C1) of a service channel containing system messages (M), characterized in that it includes at least a base transceiver station with means adapted:

10 • to mark the synchronization signal (S) in at least one frame (Fx), and
 • to transmit a pointer message (P) in the service channel of this frame (Fx) or of a subsequent frame (Fx+n).

15 8. System according to the previous claim, characterized in that it includes at least a user equipment with means adapted:

20 • to detect the marked synchronization signal (S') from said base transceiver station;
 • to receive the pointer message (P) transmitted by said base transceiver station, and
 • to extract from the pointer message (P) the position of at least a system message (M').

25 9. System according to claim 7 or 8, characterized in that it includes an additional base transceiver station adapted to detect the marked synchronization signal (S'), and synchronize in multiframe with said first base transceiver station through such marked synchronization signal (S').

30 10. System according to any claims 7 to 9, characterized in that it is adapted to implement the method according to any claims 1 through 6.

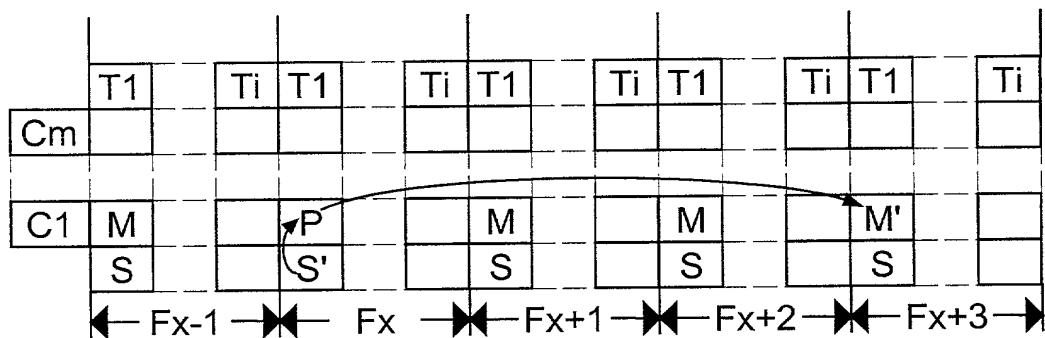
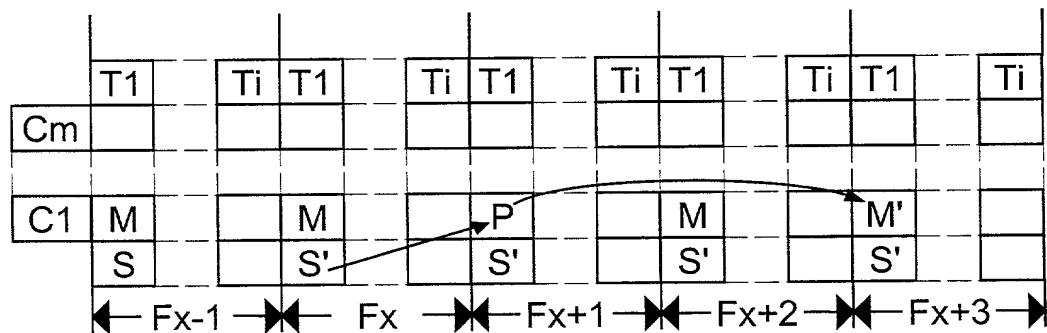
ABSTRACT

Method to synchronize at least one mobile unit to at least one base transceiver station
5 belonging to a digital telecommunication network, in which radio signals transmitted
and received by said base station are subdivided in frames (F_n) having pre-determined
duration and each frame is subdivided in a pre-determined number of timeslots (T_n) and
codes (C_n), said signals including at least a synchronization signal (S), which is
transmitted by the base transceiver station and includes a sequence of modulation
10 elementary units suitable to identify the timeslot (T_1) and the code (C_1) of a service
channel containing system messages (M), said method including the following
operational steps:

- marking the synchronization signal (S) in at least one frame (F_x) by the base
transceiver station;
- transmitting a pointer message (P) in the service channel of said frame (F_x) or of
a subsequent frame (F_{x+n}) by the base transceiver station;
- detecting the marked synchronization signal (S') by the mobile unit;
- receiving the pointer message (P) by the mobile unit;
- extracting from the pointer message (P) the position of at least one system
20 message (M') by the mobile unit.

The present invention relates also to a system implementing this method.

1/1

**Fig. 1****Fig. 2**

BIRCH, STEWART, KOLASCH & BIRCH, LLP

P.O. Box 747 Falls Church, Virginia 22040-0747
Telephone: (703) 205-8000 Facsimile: (703) 205-8050

PLEASE NOTE:
YOU MUST
COMPLETE THE
FOLLOWING

COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT AND DESIGN APPLICATIONS

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated next to my name; that I verily believe that I am the original, first and sole inventor (if only one inventor is named below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **Method and system to synchronize mobile units to a base transceiver station**

Insert Title:

Fill in Appropriate
Information -
For Use Without
Specification
Attached:

the specification of which is attached hereto. If not attached hereto,
the specification was filed on _____ as
United States Application Number _____;
and amended on _____ (if applicable) and/or
the specification was filed on JULY 24, 2000 as PCT
International Application Number PCT/EP00/07120; and was
amended under PCT Article 19 on _____ (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I do not know and do not believe the same was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representative or assigns more than twelve months (six months for designs) prior to this application, and that no application for patent or inventor's certificate on this invention has been filed in any country foreign to the United States of America prior to this application by me or my legal representatives or assigns, except as follows.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
M199A001845	ITALY	08/27/1999	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
(Number)	(Country)	(Month/Day/Year Filed)	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional applications(s) listed below.

Insert Provisional
Application(s):
(if any)

_____	(Application Number)	_____	(Filing Date)
_____	(Application Number)	_____	(Filing Date)

All Foreign Applications, if any, for any Patent or Inventor's Certificate Filed More than 12 Months (6 Months for Designs) Prior to the Filing Date of This Application:

Country	Application Number	Date of Filing (Month/Day/Year)
_____	_____	_____
_____	_____	_____

Insert Requested
Information:
(if appropriate)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States and/or PCT application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States and/or PCT application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to the patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

Insert Prior U.S.
Application(s):
(if any)

_____	(Application Number)	_____	(Filing Date)	(Status - patented, pending, abandoned)
_____	(Application Number)	_____	(Filing Date)	(Status - patented, pending, abandoned)

I hereby appoint the practitioners at CUSTOMER NO. 2292 as my attorneys or agents to prosecute this application and/or an international application based on this application and to transact all business in the United States Patent and Trademark Office connected therewith and in connection with the resulting patent based on instructions received from the entity who first sent the application papers to the practitioners, unless the inventor(s) or assignee provides said practitioners with a written notice to the contrary:

Send Correspondence to:

BIRCH, STEWART, KOLASCH & BIRCH, LLP or CUSTOMER NO. 2292

P.O. Box 747 Falls Church, Virginia 22040-0747

Telephone: (703) 205-8000 Facsimile: (703) 205-8050

PLEASE NOTE:
YOU MUST
COMPLETE
THE
FOLLOWING:

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of First
or Sole Inventor:
Insert Name of
Inventor
Indicate This
Document is Signed

Insert Residence
Insert Citizenship

Insert Post Office
Address

Full Name of Second
Inventor, if any:
see above

Full Name of Third
Inventor, if any:
see above

Full Name of Fourth
Inventor, if any:
see above

Full Name of Fifth
Inventor, if any:
see above

Full Name of Sixth
Inventor, if any:
see above

GIVEN NAME/FAMILY NAME <u>DE ANGELI ALFONSO</u>	INVENTOR'S SIGNATURE <u>de angelis Alfonso</u>	DATE* <u>30-01-02</u>
Residence (City, State & Country) <u>20010 CORNAREDO - ITALY</u>		CITIZENSHIP <u>ITALIAN</u>
MAILING ADDRESS (Complete Street Address including City, State & Country) <u>Via Ricostruzione, 18 - 20010 Cornaredo - Italy</u>		
GIVEN NAME/FAMILY NAME <u>DE BENEDITTIS ROSSELA</u>	INVENTOR'S SIGNATURE <u>Rosella de Benedittis</u>	DATE* <u>30-01-02</u>
Residence (City, State & Country) <u>20020 BARBAIANA DI LAINATE - ITALY</u>		CITIZENSHIP <u>ITALIAN</u>
MAILING ADDRESS (Complete Street Address including City, State & Country) <u>Via delle Margherite, 9 - 20020 Barbaiana di Lainate Italy</u>		
GIVEN NAME/FAMILY NAME <u>MARNONI LUCA</u>	INVENTOR'S SIGNATURE <u>luca marnoni</u>	DATE* <u>30-01-02</u>
Residence (City, State & Country) <u>21047 SARONNO - ITALY</u>		CITIZENSHIP <u>ITALIAN</u>
MAILING ADDRESS (Complete Street Address including City, State & Country) <u>Via per Ceriano, 17 - 21047 Saronno - Italy</u>		
GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP
MAILING ADDRESS (Complete Street Address including City, State & Country)		
GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP
MAILING ADDRESS (Complete Street Address including City, State & Country)		
GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP
MAILING ADDRESS (Complete Street Address including City, State & Country)		